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animal as they are incorporated in the museum.

The general catalogue carries on each card the running number of the preparation and beneath the same the accession number of the animal from which the specimen is taken. It is thus possible, while avoiding needless repetition, to ascertain at once the details concerning any preparation by reference to the accession catalogue. The cards of the general catalogue are arranged in accordance with the serial exhibition of the museum. The running number of the general museum and the accession number appear on the label of each preparation. In addition the individual preparations carry two small disks of a bright color with a number. These are the complementary numbers of the preparation, referring it to some other group with which it is related, as well as indicating its position in its proper series. For example, the shoulder-girdle of the armadillo assumes its proper place in the series demonstrating the structure of this portion of the vertebrate skeleton, and is numbered accordingly on a green disk, so that its own place in the series is preserved, green being the color of that division of the museum which deals with the development of the pectoral and pelvic arches. If the armadillo's number in the series is 17, and an additional preparation enters the series next to it, it receives green number 17a, etc.

In addition to the green number a small red disk on the armadillo preparation carries a number which refers the preparation to its proper place in the series illustrating the general anatomy of the Edentates, red being the serial color of that division. So if it is desired to put together at once for comparison all the material contained in the museum for illustration of the Edentate type, every preparation carrying a red disk is taken out of its own series

and the resulting group, when arranged in the sequence of the red numbers, forms the logical series treating of Edentate anatomy.

This plan makes every portion of the museum easily and at once accessible, and arranges the series in such a manner that each shall prove complementary to all the others.

By varying the shape of the colored labels and the character of the numerals sufficient range is obtained to meet all requirements.

In addition—as the series develop—more extensive typewritten tablets are introduced, giving the general features of the group and indicating the purpose for which it was assembled.

Photographs and drawings of the preparations, carefully labeled, are used for indicating points of special importance, in such a manner that they can be readily identified in the actual preparation. These accessories prove of aid in the use of the museum for individual study and during informal demonstrations and conferences.

I have attempted to outline for your consideration the present status of the morphological museum and its relation to the system of the university. I am convinced that the practical value of the institution will continue to make itself more and more felt, and its general adoption and development will be one of the prominent features marking our educational and scientific progress during the next decade.

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*SUGGESTIONS FOR AN ATTEMPT TO SECURE
A STANDARD COLLEGE ENTRANCE
OPTION IN BOTANY.**

THE rapid advancement of any science depends not only directly upon the re-

* Read before the Society for Plant Morphology and Physiology at the Baltimore Meeting, December 28, 1900.

searches of specialists, but also indirectly upon a favorable public opinion. Something may be done towards forming this opinion through a wide dissemination of information as to the true aims of science, but a more efficient method consists in the proper education of the coming public while it is still in school and college. From the single point of view of the advancement of his science, therefore, and apart altogether from the question of his responsibilities towards general education, it is the duty of every scientific man to contribute according to his ability towards elementary scientific education. Particularly is it the duty of every one of us connected with educational institutions to inform ourselves upon the present status and problems of this subject, and vigorously to set forth our resultant opinions upon all fitting occasions. It follows, further, that the problems of elementary scientific education are a proper subject for the consideration of any scientific society.

In these days the sciences are making great advances in education, and they are approaching, though for the most part they are still far below, the educational level of the older subjects. Amongst the sciences botany holds at present a less prominent place than it deserves; but, under the vitalizing influence of the dynamical and realistic spirit so recently infused into the subject among us, it is advancing to a greater prominence for the near future. Just at present, in botany as in many other subjects, educational discussion hinges chiefly about the contact of school and college, that is, about college entrance requirements. From this discussion three distinct educational advances are resulting: First, wider options in entrance subjects generally; second, a greater emphasis upon the sciences; and third, a determined movement to secure greater uniformity in the requirements made by different colleges in the

same subject. With the first of these advances we are not here concerned except to express our approval. In the second we have a more direct interest, though it is not in discussion in the present paper. I take it for granted we are all agreed that science should form an integral part of the education of every individual from the kindergarten to, into and in the college, and that botany should hold among the sciences the place to which its nature entitles it. Apart, however, from the abstract merits of the case, it is a fact that some of the leading colleges of the country do now either require a science for entrance, or else will admit the sciences as options, sometimes even to the amount of one-third of their total entrance requirement. Some schools are already teaching sciences well, and under the stimulus of a wider acceptance of their results by the colleges, such teaching will unquestionably both further improve and widely spread. We cannot doubt, therefore, that the present movement is towards the general acceptance by the colleges of the sciences, with botany among them, as options, if not as a requirement, for entrance. If, in the colleges with which we are connected, the sciences, including botany, are not accepted for entrance, it should at least not be through default of vigorous championship upon our part.

It is, however, with the third advance mentioned above, namely, with the effort to secure uniformity in requirements in the same subject, that we are now immediately concerned. It is well known that the varied demands made by different colleges in the same subjects impose a most serious burden upon those preparatory schools which prepare students for several colleges, requiring multiplication of classes, division of resources, waste of energy, and, worst of all, a too great subordination of true education to preparation for the passing of examinations. This mal-adjustment of preparatory schools

as a whole to colleges as a whole constitutes one of the most serious educational problems of the present time. So serious is it that not only has the National Educational Association given its best energies for some years past to the endeavor to formulate standard national courses, but associations of colleges and preparatory schools, with large and influential membership, have been formed chiefly to grapple with it. All these efforts, be it noted, are not at all toward a uniform total requirement for all colleges, but simply toward a uniform general mode of treatment of each particular subject, and the colleges are left as free as before to make any desired permutations and combinations of subjects. The most important and practical step of all in this direction has recently been taken in the formation of the College Entrance Examination Board of the Middle States and Maryland, which is to have charge not only of the specifications of requirements in the individual subjects, but also of the uniform administration of those requirements through its own examinations. Steps have been taken, also, looking to the formation of a similar board for the New England States. Requirements have already been formulated by the former board in several subjects, but not yet in botany. Now, a question of immediate interest to us is this, what is to be the requirement adopted by these boards in botany? One would naturally expect that the course outlined by the Botanical Committee of the National Educational Association would be adopted; but this course, although embodying many good features, is not adapted, nor was it intended, for immediate practical use. If the formulation of new courses is left to the advisers of the board for the Middle States and Maryland, and to the New England Board, and to similar boards elsewhere, it is unlikely that uniformity will be secured; for such

boards, like individual colleges, will not only probably be shy of accepting one another's requirements *in toto*, but also each board will be swayed by the particular views of the most prominent teacher consulted. On the other hand, a course carefully and comprehensively formulated by some central and representative scientific association, based upon the best of the previous work done in this direction, and elaborated with the cooperation of the leading teachers and of other botanical organizations throughout the country, will stand a chance of wide acceptance, and perhaps, too, is likely to be a better course than a more limited body could develop. Such a course must obviously be widely accepted in order to be of real use; but, once firmly established, it will not only permit schools to concentrate their energies upon a single and excellent method of preparation which will allow any student to enter any college and give a good education to those who do not, but also at the same time it will constitute a sort of standard of comparison and measure of value, a definite ideal towards which ambitious schools may work, and a stimulus to other colleges to adopt botany among their entrance subjects. It is the object of this paper to propose that this society undertake the formulation of such a standard or uniform entrance option in botany, and take steps to secure its adoption.

It remains now to note briefly what we have to build upon in such a formulation, what conditions must be taken account of, and what practical steps may best be taken.

The idea of a standard entrance option in botany is far from being new. It was implied in the well-known report of the Committee on Secondary School Studies of the National Educational Association (commonly known as the Committee of Ten). The recommendations of the botanical section of that committee had without doubt a powerful influence upon botanical teach-

ing in this country, and that they were not more widely adopted was due partly to the then transitional state of botanical teaching, and partly to difference of opinion as to the wisdom of some of its recommendations. The discussions of the same Association led in subsequent years to the exposition of the idea of standard entrance options, and these are set forth with the greatest clearness in the report of the committee on college entrance requirements of that Association published in July, 1899. Now, if the course in botany recommended in that report were adapted to immediate use, and if it had the approval of the majority of teachers, there would be nothing left to be done except to urge its adoption. In fact, however, whatever we may think of the merits or demerits of the course, we must all agree that it is impracticable at present for the great majority of schools. That course, with its great emphasis upon ecology, represents an extreme reaction from the old formal systematic studies, and, as is usual in such cases, the truth will doubtless ultimately be found to lie between the extremes. I had myself the honor to be consulted in the preparation of that report and gave my adherence to it as to an ideal scheme to be worked towards rather than as one to be brought into immediate practical operation. What is needed at present, however, is a course which, while setting a high and stimulating standard of intellectual work, can be brought practically and profitably into operation in the immediate future.

It will help us to understand the situation if we glance at the status of botany as an entrance subject in a few of the leading colleges. Those which follow are selected partly at random and partly because their announcements happen to be at present accessible to me, but doubtless they are fairly representative. *Bryn Mawr* requires a science, which may be botany, from all stu-

dents, but the amount is small; apparently no sciences are accepted as options. *Chicago* accepts botany, a year's preparation, as a free option, counting 1 out of 15 points, and will accept 4 out of 15 points in sciences. *Columbia* accepts sciences as options up to 3 points out of 15, of which botany may count 1 point. *Cornell* accepts a science, which may be botany, as an alternative for the otherwise required mathematics. *Harvard* requires a science, which cannot be botany, counting 2 out of 26 points for entrance to the college, and will accept 7 or 8 points of sciences as options; botany, however, is accepted to count 1 point out of 21 for entrance to the Lawrence Scientific School, for which 5 points in the sciences out of 21 will be accepted as options. *Johns Hopkins* requires a science, which may be botany, but the amount required is small. *Leland Stanford* accepts 5 points out of 15 in sciences, of which botany may be one, counting 1 point. *Michigan* requires a year of physics absolutely of all students, and in addition accepts three years of science, of which botany may occupy either a year or, in combination with zoology, a half year. *Minnesota* appears to accept $5\frac{1}{2}$ points out of 15 in sciences as options, of which botany may count as $\frac{1}{2}$ or 1 point. *Nebraska* accepts 7 points in sciences out of 28 as options in one college; of which botany may count 2 points: and requires 3 points in the sciences, of which botany may be 1 point in the other college, and in the latter apparently 7 points in addition may be taken as options. *Smith* will accept the equivalent of 5 points out of 15 in the sciences as options, of which botany may count either as 1 point for a year of preparation or as 2 for two years, preparation. Of other colleges, some do not accept any sciences at all, while a few others which accept some of the sciences do not include botany among them. It appears, also, as would be expected, that the

liberal acceptance of the sciences is more common in the Central and Western than in the Eastern States.

The limits of my time will not permit even a summary of the preparation called for by the above-mentioned colleges, and it must suffice to say that this ranges from requirements little more than nominal up to some which are satisfactory in plan and scope. One characteristic which most of them show is a great liberality in the details of preparation, amounting in some cases practically to the acceptance of any good course. All this indicates a very undifferentiated condition of botanical teaching among us, a fact which, along with its many drawbacks, has at least this advantage from our present point of view, that it will be much easier to secure the adoption of a standard course than would be the case if the teaching were more differentiated. Although the preparation required appears at first sight to be very different for the different colleges, closer study shows that there are many common features, and these will form the natural and excellent foundation for the new course.

The ideal position for botany in the entrance curriculum, indeed the position towards which it seems in the most progressive institutions to be tending, is this : any college which requires any number of particular subjects should require a science ; every college should accept as options enough of the sciences to allow a student thus to utilize four years of thorough high-school work in the sciences ; botany should be included among these sciences ; the preparation should be of such a character that it will yield a training fully equal to that afforded by any other subject studied for the same length of time, and will admit the student to second courses in college.

It will be agreed, I think, that the formulation and successful working of a standard entrance option is a matter of

much importance to us. But no such course can be formulated, much less brought into use, unless all teachers approach it in a friendly and cooperative spirit, each willing to yield some of his own individual views for the sake of the common good. It must be in the nature of a compromise, though it is by no means necessary that it shall represent a composite of all existent views. It must of course be elastic enough to allow full play to individual methods and the use of any good text-books, and must be standard in its framework rather than in its details. It will of course be binding upon no one, and must make its way, if at all, by its merits ; and it will be liable to minor changes in the future, based upon trial and scientific advances. Colleges would naturally first adopt it as an alternative to their own systems. Especially it should face squarely the issue of providing a course equal in training value to the other subjects, for by this test botany, and the other sciences, must be judged, and stand or fall in the educational system.

With full faith in the possibility of preparing such a course, I would ask the Society :

1. Does a standard or uniform college entrance option in botany seem desirable ?
2. Does it seem possible of attainment ?

If the answer to these questions is in the affirmative, I would propose :

a. That a committee of three be appointed by the president before the close of this meeting, with power to open communication in the name of the Society with colleges, examination boards and individual teachers upon this subject, and to take such steps as their judgment approves towards formulating and securing the adoption of such an entrance option.

b. That the committee make the attempt to secure an option nationally acceptable, but if this be found impracticable, then it

shall be attempted only for the region covered by the work of the College Entrance Examination Board of the Middle States and Maryland, and of the corresponding New England board if formed.

c. That the committee be authorized to draw upon the secretary-treasurer for its expenses of printing, etc., up to a limit of \$20.00.

The Society voted to approve this plan with the proviso that the Committee should submit to the memoirs by mail a preliminary printed report, and should be guided by any opinion submitted by a majority of the members. The president appointed Messrs. Ganong, Lloyd and Atkinson such a committee. The preliminary report of the committee is now ready, and will be sent to members of the Society and to others known to be interested. Others wishing to see the report may obtain copies by application to the writer. The appearance of the final report will be announced through SCIENCE.

W. F. GANONG.

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THE MICHIGAN ACADEMY OF SCIENCE.

THE seventh annual meeting of the Michigan Academy of Science was held at the University of Michigan, Ann Arbor, March 28th, 29th, and 30th, under the presidency of Professor Chas. E. Barr, of Albion College.

The general session of Thursday afternoon, March 28th, was devoted to the geological and archeological surveys of the State. The Secretary read a paper by Mr. Harlan Smith, of the American Museum of Natural History, on 'An Archeological Survey of Michigan,' and Mr. Geo. W. Bates, president of the Detroit Archeological Society, presented a second paper by Mr. Smith, on 'The Antiquities of Michigan, Their Value and Impending Loss.' This paper described many of the archeological remains of Michigan, and urged that steps should be taken to preserve them. (At a later meeting the Academy endorsed a bill now before the Legislature, providing for an archeological survey of the State.)

Dr. A. C. Lane presented a paper (read by the Secretary) on 'Recent Work of the State Geological Survey,' and Mr. Frank Leverett, of the U. S. Geological Survey, gave an account of 'Glacial Investigations in Michigan.' These papers showed that the Government and State Surveys are cooperating, and supplementing each other's work in many respects. The State Survey is devoting itself chiefly, in the lower peninsula, to the study of marl, and to a correlation of the various coal seams; in the upper peninsula to a correlation and study of the copper-bearing lodes. Mr. Leverett's paper presented certain economic and scientific results of the U. S. Geological Survey, particularly in the mapping and interpretation of topographic features, and in variations in the structure of glacial deposits. The successive positions of the margin of the glacial ice were shown to be marked by moraines or massive belts of rolling country which are found to sweep around the basins of Lake Michigan, Saginaw Bay and Huron-Erie. These carry on their outer borders more or less extensive plains of gravel and sand, which were formed by the outflowing waters of the melting ice-sheet. The distribution of these moraines and bordering gravel plains indicates that the first counties of Michigan to be uncovered by the melting back of the ice are Branch, St. Joseph, Kalamazoo and Calhoun, and the water from the ice then flowed to the Kankakee River, past South Bend, Ind. The ice margin melted back from these counties toward the lake basins to the west and north and east, and after a time it shrunk within the present limits of the Great Lakes. The lake history connected with the present system of Great Lakes is very complicated and as yet but partially worked out.

The Academy then divided into sections of botany, zoology, sanitary science and agriculture, and sectional meetings were